



University of Bahrain
College of Information Technology
Department of Computer Engineering
Final Test

ITCE 363: Electronics 2

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14 Jan 2015	<u>Name:</u>	Dept: CE
Time: 120 minutes	<u>ID #:</u>	Section: 1

741 OP AMP (GBW = 1 MHz, Slew Rate = 0.5 V/ μ s)

<u>Q</u>	Max Points	Distribution	Points Scored
1	25	6+4+5+4+6	
2	25		
3	25		
4	25		
Grade out of 100			

Show your WORK

Q1. Using three 741 OP AMPs, design a 3-stage amplifier in which:

$A_{v1} = 10$ $A_{v2} = -5$ $A_{v3} = 3$. $+V_{CC} = |-V_{EE}| = 12\text{ V}$

a) Draw a clear circuit diagram.

b) Find maximum input signal voltage below which distortion may not occur.

c) Discuss with equation how to find the small signal bandwidth of the amplifier.

d) Find the power bandwidth of the amplifier

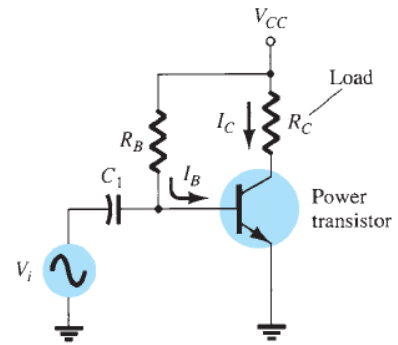
- e) Find the voltage gain in dB and phase shift of the amplifier at frequency = 20 Hz, 200 kHz and 20 MHz.

Q2.

In the following class A amplifier, $V_{CC} = 12\text{ V}$

$R_C = 4\text{ ohms}$, $\beta = 25$:

a) Find best R_B



b) Derive and find the maximum efficiency of the amplifier.

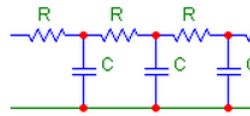
c) Find the minimum power dissipated by the transistor

d) Find the minimum requirement for heat sink specification for this amplifier at 30 °C environment .

Assume $T_{j_{\max}} = 175\text{ }^{\circ}\text{C}$, $\theta_{jc} = 2\text{ }^{\circ}\text{C/W}$, $\theta_{CH} = 1\text{ }^{\circ}\text{C/W}$

e) Estimate the power gain of the amplifier.

Q3. Using the following RC phase-shift circuit, **derive** then **design** a 1 kHz phase shift oscillator. You may use a transistor **or** an OP AMP.



Q4. In the following OP AMP relaxation oscillator, $+V_{CC} = |-V_{EE}| = 12\text{ V}$

$R_1 = 10\text{ k}$, $R_2 = R_3 = 22\text{ k}$, $C = 0.1\text{ }\mu\text{F}$

Find frequency of oscillation and clearly plot V_c and V_{out} waveforms.

